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Detailed analysis of elastofibroma dorsi cases detected incidentally on thorax CT

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ABSTRACT

Aims: Elastofibroma dorsi (ED) is a benign pseudotumor detected by Computed Tomography and/or Magnetic resonance imaging due to the penetration of fibrous and fatty tissues between the muscle structures and is more common in elderly people, especially in women, with subscapular topography. This study investigated the prevalence of elastofibroma dorsi in large series and CT findings.

Methods: A total of 469 patients (212 females, 257 males) who underwent thoracic computed tomography for various reasons were included in this study. The presence, dimensions, contour and density of ED were investigated in these patients.

Results: The mean age of 469 patients was 54.51±17.42 (18-88 years). Elastofibroma was detected in 15.5% (n=73) of these patients. It was determined that 69.9% (n=51) of the patients with ED were female, and the mean age of these patients was 63.21±15.72. ED was usually isodense in both genders. Again, in both genders, ED was more regularly contoured, and the fat planes between adjacent muscle structures were usually closed.

Conclusion: Additional studies are not required when the lesion is typical and asymptomatic on CT scans. However, surgical treatment may be recommended if the lesion is symptomatic or if doubt remains regarding the benign nature of the lesion.

Keywords: Elastofibroma dorsi, computed tomography, prevalence

INTRODUCTION

Elastofibroma dorsi (ED) is often located in the lower subscapular region between the thorax wall and the scapula.[1] Originating from fibrous tissue, ED is actually a benign soft tissue tumor that tends to grow slowly.[2] The lesion was named elastofibroma dorsi because of its characteristic subscapular-infrascapular location.[3] In 99% of cases, it is located in the lower corner of the scapula between the musculus latissimus dorsi and the serratus anterior, adherent to the periosteum of the thoracic wall. Although ED is a benign tumor, it can mimic soft tissue tumors such as sarcoma or fibromatosis.

ED was defined by the World Health Organization in 2002 as a benign fibroblastic/myofibroblastic tumor in the classification of soft tissue tumors.[4] Although it is thought that the etiology of ED may be a reactive lesion as a result of abnormal degeneration of elastic fibers due to the friction of the scapula against the thoracic fascia, its pathogenesis is still not entirely determined.[5] However, it has been reported that microtrauma, genetic factors, gender, fibroelastic tissue changes and age may play a role in the etiology.[6,7] Although the fact that ED is more common in people who do heavy work, especially using their hands, supports this view, ED can also be seen in people who have not worked in heavy-duty jobs throughout their lives and in different settlements.[8] Due to its rarity, the diagnosis and treatment algorithm is unclear. Although considered a rare soft tissue mass, small and subclinical elastofibromas were detected in 24% of women and 11% of men in autopsy series over 55 years of age.[9] Its incidence in autopsy studies is 13-17%.[10] Although it is mainly detected unilaterally in female patients over 50 years of age, it can be seen on both sides at a rate of 10% and is very rare in children.[11,12]

ED may not cause clinical complaints in half of the patients, and it is asymptomatic because it does not cause symptoms before reaching a certain size.

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However, painful swellings larger than five centimeters may raise suspicion of malignancy.[2] It is generally described as an ill-defined mass with symptoms such as back and shoulder pain, a popping sound in the back, swelling at the lower pole of the scapula, discomfort, cracking, stiffness, and occasional pain.[13,14] In a patient who presents with these complaints, even if no pathology is detected in the physical examination, a computed tomography (CT) examination should be performed.[8] CT is a reliable and noninvasive technique that can show the characteristic fibrous and fat components of the mass. It is typically seen as a solitary, heterogeneous and irregularly circumscribed soft tissue mass on CT, and diagnosis with CT is important in preventing radical surgery. This study investigated the prevalence of ED in large series and CT findings.

METHODS

The study was carried out with the permission of Ankara Bayındır Private Hospital Ethics Committee (Date: 24.03.2023, Decision No: BTEDK-2023/8). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Research Design

Four hundred sixty-nine patients (212 females, 257 males) with adequate image quality were included in the study. After excluding the examinations with technical problems due to respiratory artifact and movement, out of 492 patients who underwent thorax Computed Tomography (CT) between 01.2021 and 04.2023 in hospital. The mean age of the patients included in the study was 54.51±17.42 (18-88 years).

Research Parameters

In this study, which was carried out to determine the radioanatomical features of ED, the parameters as the presence of ED, the density of the ED according to the adjacent muscular structure (isodense, hypodense or hyperdense), regular or irregular ED contour, and open or closed fat plane between the ED and adjacent muscular structures were examined (Figure 1).

CT Protocol

CT examinations were performed in the supine position with a multislice computed tomography device (MSCT) (General Electric IQ™ 32-Detector Spiral MSCT). The acquisition parameters are 200-320 mAS, 120 kV, an average 350 mm field of view (FOV), and 1.25 mm slice thickness. Images were evaluated axially, coronally, and sagittally in the bone and soft tissue windows. RadiAnt DICOM Viewer 2022.1 program was used for evaluation processes. All measurements were conducted by two radiologists together.

Statistical Analysis

All the measurements were performed on the osseous surfaces. Length measurements are in millimeters (mm). Statistical analyses were carried out using SPSS for Windows statistical package (version 21.0; SPSS, Chicago, Illinois), and a p-value <.05 was considered statistically significant.

RESULTS

As a result of the analysis, elastofibroma was detected in 15.5% (n=73) of 469 patients, while elastofibroma was not present in 84.6% (n=397). A bilateral tumor was observed in 2 of 73 patients with ED, and a unilateral tumor was observed in the others (Figure 2).

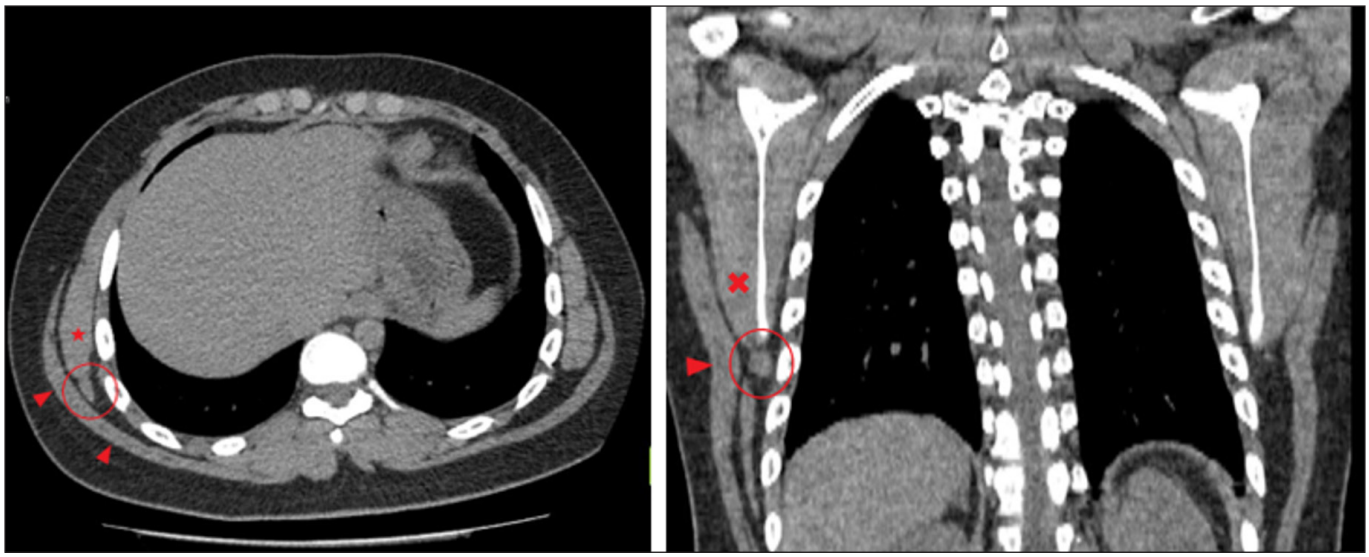

Figure 1: (a) Axial non-contrast CT images of a 19-year-old male patient show an ED mass (in-circle), well-contoured, hypodense, and a clear fat plane between the muscle (b) coronal reformat image of the same patient, star (*): musculus serratus anterior, arrowhead: musculus latissimus dorsi, x: musculus infraspinatus.

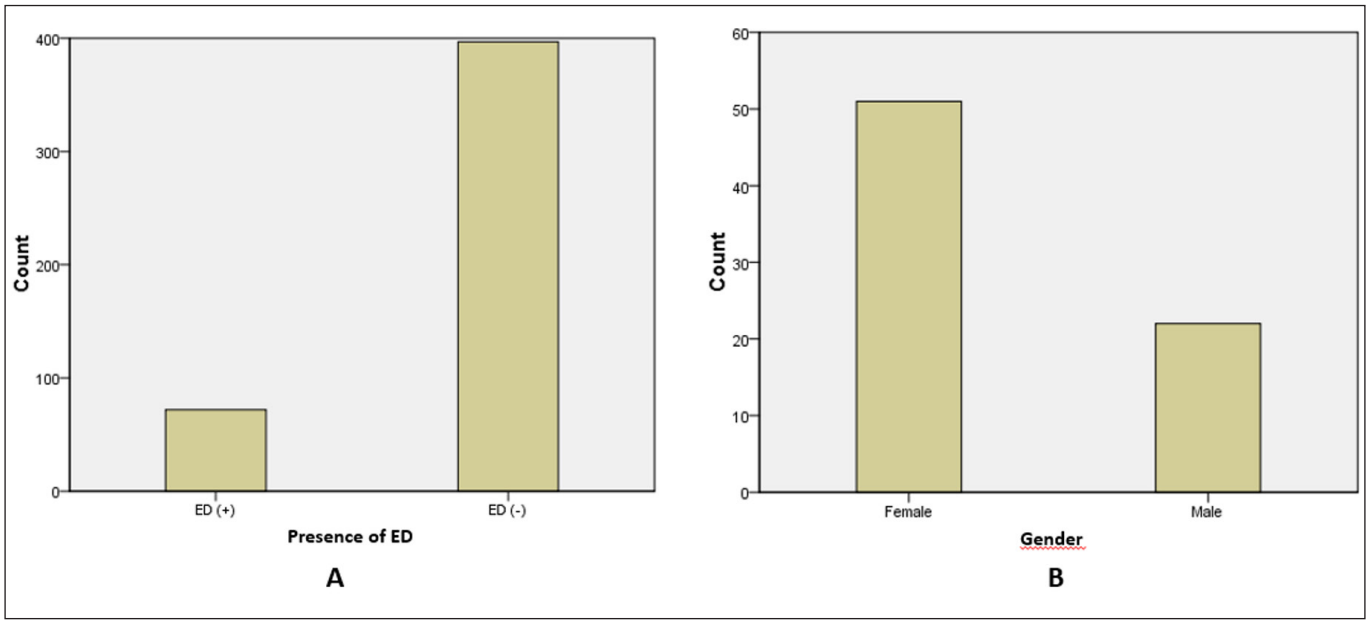

Figure 2: A: Presence of ED, B: Distribution of patients with ED by gender

Elastofibroma was seen in 69.9% (n=51) females and 30.1% (n=22) males (Figure 2). While ED was observed on the right side in 53.4% (n=39) of the patients, it was observed on the left side in 46.6% (n=34).

The mean age of the patients diagnosed with elastofibroma was 63.21±15.72 years. Considering the rates of elastofibroma in people younger than 60 years old and over, it was determined that 24.7% (n=18) of those with ED (+) were under 60 years old, and 75.3% (n=55) were individuals over 60 years old. In the distribution of age by gender, it was determined that 74.5% of the women were >60 years old (Figure 3).

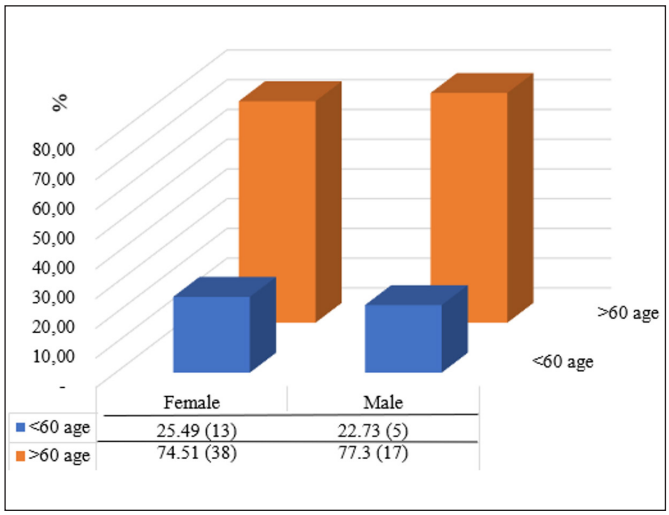

Figure 3: Distribution of ED presence by age and gender (%(n))

The ED density was 12.3% (n=9) hyperdense, 53.4% (n=39) isodense, 34.2% (n=25) hypodense, and the ED contour was found regular in 87.7% (n=64) of the patients and irregular in 12.3% (n=9). It was found that the fat plane between the ED and the adjacent muscle was open in 16.4% (n=12) of the patients and closed in 83.6% (n=61) (Figure 3). The distribution between the sides is summarized in Table 1.

Table 1. Distribution of ED morphology by sides

	Total		Right		Left	
	N	%	N	%	N	%
ED density						
Hyperdense	9	12,3	5	12,8	4	11,8
Isodense	39	53,4	20	51,3	19	55,9
Hypodense	25	34,2	14	35,9	11	32,4
ED contour						
Regular	64	87,7	34	87,2	30	88,2
Irregular	9	12,3	5	12,8	4	11,8
ED fat plane						
Open	12	16,4	6	15,4	6	17,6
Closed	61	83,6	33	84,6	28	82,4

While the mean elastofibroma size was 31×25×17 mm on the right side, it was determined as 32×24×16 mm on the left side. It was determined that there was statistical significance between them, and the masses on the right side were generally larger than on the left side ($p<0.05$). It was determined that the tumors were at least 5×4×2 mm in size and at most 94×88×60 mm.

It was determined that ED was found on the right side in 54.9% of women and equally on the right and left sides of men. ED was usually isodense in both genders. In both sexes, ED was more regularly contoured, and the fat planes between adjacent muscle structures were usually closed (Table 2).

Table 2. Distribution of ED morphology by gender

		Gender		Total
		Female	Male	
Side				
Right	N	28[a]	11[a]	39
	%	54,9%	50,0%	53,4%
Left	N	23[a]	11[a]	34
	%	45,1%	50,0%	46,6%
Total	N	51	22	73
	%	100,0%	100,0%	100,0%
ED Density				
Hyperdense	N	8[a]	1[a]	9
	%	15,7%	4,5%	12,3%
Isodense	N	23[a]	16[a]	39
	%	45,1%	72,7%	53,4%
Hypodense	N	20[a]	5[a]	25
	%	39,2%	22,7%	34,2%
Total	N	51	22	73
	%	100,0%	100,0%	100,0%
ED Contour				
Regular	N	46[a]	18[a]	64
	%	90,2%	81,8%	87,7%
Irregular	N	5[a]	4[a]	9
	%	9,8%	18,2%	12,3%
Total	N	51	22	73
	%	100,0%	100,0%	100,0%
ED fat plane				
Open	N	8[a]	4[a]	12
	%	15,7%	18,2%	16,4%
Closed	N	43[a]	18[a]	61
	%	84,3%	81,8%	83,6%
Total	N	51	22	73
	%	100,0%	100,0%	100,0%

DISCUSSION

Elastofibroma dorsi is a rare lesion that should be known, diagnosed and treated in a patient who presents with functional disturbance in scapula movement. Repetitive micro-injuries between the chest wall and scapula, the source of collagen degeneration, and excessive elastin production may play a pathophysiological role in this rare lesion.[15,16] Hisaoka et al.[17] suggested that ED may not be a simple reactive fibroblastic pseudotumor but rather a monoclonal neoplastic process with genomic instability. Nishio et al.[18] emphasize that recurrent 1p and Xq abnormalities are evident in elastofibroma dorsi, and further studies are needed to determine the biological consequences of these genomic changes in elastofibroma dorsi.[18] However, first of all, radiological evaluation should be done very well. Based on these data, there are generally case reports and review studies on ED in the literature.[2,11,19,20] and radiological studies on large sample groups are very limited. Therefore, this study was conducted to investigate the prevalence of ED in large series and CT findings.

The most important assessment for elastofibroma dorsi is undoubtedly CT, as Alouni et al.[21] suggested. CT reveals characteristic findings that may lead to a presumptive diagnosis of elastofibroma. In all patients, CT can clearly show the changing fibrous tissue and adipose tissue pattern, as well as the highly characteristic location of the tumor. Boundaries may be indistinct, and the tumor may be heterogeneous.[22] In the most typical pattern, fatty tissue lines alternate with fibrous tissue filaments to form straight or curved lines roughly parallel to the chest wall. All of the positive patients in our study had these typical patterns; thus, a possible diagnosis of elastofibroma dorsi was obtained. Some other diagnoses must be ruled out if features are atypical, including lipoma, differentiated liposarcoma, and hemangioma.

Elastofibromas are traditionally considered rare, but their exact prevalence is unknown. In a study conducted with CT, it was stated that 2% of adults over the age of 60 have incidental lesions.[23] Jarvi and Lansimies reported that they detected elastofibroma in the subscapular thoracic fascia in 24.4% of females and 11.2% of males in a postmortem series in which they examined 235 cases older than 55 years.[24] Blumenkrantz reported to detect ED in 1.66% of 1751 patients who underwent PET/CT.[25] The inconsistency in incidence is likely related to the large variability in tumor size. Larger studies of elastofibromas report that ED predominates in females over 50.[26-28] In their study with 14 patients with ED, Sarıçam et al.[29] reported that 72.5% were females, and the median age was 54.2. In our series, 15.5% (n=73) of 469 patients had elastofibroma, while 69.9% (n=51) of these patients were female, and 75.3% (n=55) were patients over 60 years of age, and ED was present unilaterally in all patients except 2 patients.

According to our research results, the average size of elastofibroma was 9×8×6 mm on the right side and 6×5×2 mm on the left side. It was determined that there was statistical significance between them, and the masses on the right side were generally larger than on the left side. There are no results in the literature on tumor size between the right and left sides.[9,30] It has been reported that surgical treatment can usually be performed for masses larger than ≥5 cm and due to aesthetic concerns.[5] Although the subscapular region is a richly vascularized anatomical region, often at risk of hematoma, complete excision can be easily achieved with healthy surgical margins. However, since the elastofibromas detected in this study are small in size and determined by screening and are probably asymptomatic, it is thought that surgical treatment is not required.

The typical feature on CT is an unencapsulated, lenticular-shaped mass with the largest dimension craniocaudal, with a density of adipose tissue in

the form of isodense, hypodense lines compared to adjacent musculature. The absence of bone structures in ED masses is one of the characteristic features of ED.[21] Tumors can often be distinguished by weak differentiation from the margins of the surrounding muscles on CT and give the impression of being part of the intercostal muscles.[31] Radouane et al.[32] reported that the borders of elastofibromas are clearly and distinctly visible on CT.[32] Our results determined that elastofibroma was seen as isodense in 53.4% of the patients, regular contour in 87.7% and enclosed fat plane in 83.6%. There was no statistically significant difference between the radiological appearances of ED in male or females. Fibrolipoma, a rare variant of lipoma, has a prominent fibrous tissue component and may have imaging findings that overlap with elastofibroma dorsi if these structures have a prominent hypointense signal.[18] In the presence of typical CT findings found in most of our patients, the diagnosis of elastofibroma dorsi can be easily considered. In the presence of atypical findings on CT, it is thought that the typical localization of the lesion, its bilateral nature, and the fact that the patient is elderly and female will support the diagnosis of elastofibroma dorsi.

Finally, the prevalence of ED in the elderly, especially in females, its subscapular topography, bilateral/unilateral nature, and findings on cross-sectional imaging (CT and/or MRI) are sufficient for a positive diagnosis, thus avoiding systematic biopsies and unnecessary surgical resection. Therefore, it is thought that the radiological findings of ED should be analyzed accurately and well.

CONCLUSION

ED is a benign tumor that mainly affects people over the age of 50 and predominantly females. It typically presents as a soft, mobile mass located in the subscapular region, causing swelling and pain on movement. Considering its possible location, the diagnosis should be confirmed by both careful physical examination and radiological studies.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Ankara Bayındır Private Hospital Noninvasive Clinical Researches Ethics Committee (Date: 24.03.2023, Decision No: BTEDK-2023/8).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

REFERENCES

1. Daigeler A, Vogt PM, Busch K, et al. Elastofibroma dorsi--differential diagnosis in chest wall tumours. *World J Surg Oncol.* 2007;5:15. doi:10.1186/1477-7819-5-15
2. Muramatsu K, Ihara K, Hashimoto T, Seto S, Taguchi T. Elastofibroma dorsi: diagnosis and treatment. *J Shoulder Elbow Surg.* 2007;16(5):591-595. doi:10.1016/j.jse.2006.12.010
3. Guha AR, Raja RC, Devadoss VG. Elastofibroma dorsi--a case report and review of literature. *Int J Clin Pract.* 2004;58(2):218-220. doi:10.1111/j.1368-5031.2004.0051.x
4. Fletcher C. Pathology and genetics of tumors of soft tissue and bone. *World Health Organ Classif Tumors.* 2002;4:35-46.
5. Chandrasekar CR, Grimer RJ, Carter SR, et al. Elastofibroma dorsi: an uncommon benign pseudotumour. *Sarcoma.* 2008;2008:756565. doi:10.1155/2008/756565
6. Deveci MA, Özbarlas HS, Erdoğan KE, Biçer ÖS, Tekin M, Özkan C. Elastofibroma dorsi: clinical evaluation of 61 cases and review of the literature. *Acta Orthop Traumatol Turc.* 2017;51(1):7-11. doi:10.1016/j.aott.2016.10.001
7. Sezer HF, Eliçora A, Topcu S, Abdullayev G. Elastofibroma Dorsi: Tek Merkez Deneyimi. *Ankara Üniversitesi Tıp Fakültesi Mecmuası.* 2021;74(2):264-268.
8. Karakurt O, Kaplan T, Gunal N, et al. Elastofibroma dorsi management and outcomes: review of 16 cases. *Interact Cardiovasc Thorac Surg.* 2014;18(2):197-201. doi:10.1093/icvts/ivt442
9. Başaran C, Yıldırım Dönmez F, Öztürk A, Tarhan NÇ. Elastofibroma dorsi'de MRG bulguları. *Fırat Tıp Derg.* 2009;14(1):65-68.
10. Giebel GD, Bierhoff E, Vogel J. Elastofibroma and pre-elastofibroma--a biopsy and autopsy study. *Eur J Surg Oncol.* 1996;22(1):93-96. doi:10.1016/s0748-7983(96)91781-3
11. Kara M, Dikmen E, Kara SA, Atasoy P. Bilateral elastofibroma dorsi: proper positioning for an accurate diagnosis. *Eur J Cardiothorac Surg.* 2002;22(5):839-841. doi:10.1016/s1010-7940(02)00475-x
12. Devaney D, Livesley P, Shaw D. Elastofibroma dorsi: MRI diagnosis in a young girl. *Pediatr Radiol.* 1995;25(4):282-283. doi:10.1007/BF02011101
13. Majó J, Gracia I, Doncel A, Valera M, Núñez A, Guix M. Elastofibroma dorsi as a cause of shoulder pain or snapping scapula. *Clin Orthop Relat Res.* 2001;(388):200-204. doi:10.1097/00003086-200107000-00027
14. Yücel İ, Solak K, Arican M, Özturan KE. Bilateral elastofibroma dorsi. *Göztepe Tıp Derg.* 2012;27(2):80-85.
15. Fibla J, Laureano M, Vicente M, Javier P, Gonzalo V. Élastofibrome dorsal bilatéral. *Rev Rhum.* 2007;74:294-6.
16. Charissoux JL, Mabit Ch, Fiorenza F, Gougam Th, Leboute MJ. Élastofibrome de l'espace scapulothoracique. Revue de la literature: à propos d'un cas. *Revue Chir Orthop.* 2000;86:98-103.
17. Hisaoka M, Hashimoto H. Elastofibroma: clonal fibrous proliferation with predominant CD34-positive cells. *Virchows Arch.* 2006;448(2):195-199. doi:10.1007/s00428-005-0053-9
18. Nishio J, Nakayama S, Nabeshima K, Yamamoto T. Current update on the diagnosis, management and pathogenesis of elastofibroma dorsi. *Anticancer Res.* 2021;41(5):2211-2215. doi:10.21873/anticanres.14997
19. Nishio J, Aoki M, Nabeshima K, Iwasaki H, Naito M. Imaging features of desmoid-type fibromatosis in the teres major muscle. *In Vivo.* 2013;27(4):555-559.

20. Kourda J, Ayadi-Kaddour A, Merai S, Hantous S, Miled KB, Mezni FE. Bilateral elastofibroma dorsi. a case report and review of the literature. *Orthop Traumatol Surg Res.* 2009;95(5):383-387. doi:10.1016/j.otsr.2009.05.002
21. Alouini R, Allani M, Harzallah L, Bahri M, Kraiem C, Tlili-Graies K. Imagerie de l'élastofibrome dorsal [Elastofibroma: imaging features]. *J Radiol.* 2005;86(11):1712-1715. doi:10.1016/s0221-0363(05)81513-6
22. Faccioli N, Foti G, Comai A, Cugini C, Guarise A, Mucelli RP. MR imaging findings of elastofibroma dorsi in correlation with pathological features: our experience. *Radiol Med.* 2009;114(8):1283-1291. doi:10.1007/s11547-009-0442-2
23. Saint-Paul MC, Musso S, Cardot-Leccia N, et al. Elastofibroma of the stomach. *Pathol Res Pract.* 2003;199(9):637-639. doi:10.1078/0344-0338-00474
24. Järvi OH, Länsimies PH. Subclinical elastofibromas in the scapular region in an autopsy series. *Acta Pathol Microbiol Scand A.* 1975;83(1):87-108. doi:10.1111/j.1699-0463.1975.tb01361.x
25. Blumenkrantz Y, Bruno GL, González CJ, Namías M, Osorio AR, Parma P. Characterization of elastofibroma dorsi with (18)FDG PET/CT: a retrospective study. *Rev Esp Med Nucl.* 2011;30(6):342-345. doi:10.1016/j.remn.2011.01.006
26. Nagamine N, Nohara Y, Ito E. Elastofibroma in Okinawa. A clinicopathologic study of 170 cases. *Cancer.* 1982;50(9):1794-1805. doi:10.1002/1097-0142(19821101)50:9<1794::aid-cncr2820500925>3.0.co;2-l
27. El Hammoumi M, Qtaibi A, Arsalane A, El Oueriachi F, Kabiri el H. Elastofibroma dorsi: clinicopathological analysis of 76 cases. *Korean J Thorac Cardiovasc Surg.* 2014;47(2):111-116. doi:10.5090/kjtcs.2014.47.2.111
28. Abat F, Álvarez C, Trullols L, Peiró A, Bagué S, Gracia I. Elastofibroma dorsi: 7 años de seguimiento de 37 casos y revisión de la literatura [Elastofibroma dorsi: a 7-year follow-up of 37 cases and a review of the literature]. *Rev Esp Cir Ortop Traumatol.* 2012;56(4):295-299. doi:10.1016/j.recot.2012.03.004
29. Sarıçam M, Özkan B, Kara M. Preventing the development of recurrence and postoperative seroma of elastofibroma dorsi. *Eurasian Journal of Medicine and Oncology.* 2019;3(2):116-119.
30. Alberghini M, Bacchini P, Pignatti G, et al. Histochemical and ultrastructural study of an elastofibroma dorsi coexisting with a high grade spindle cell sarcoma. *Eur J Histochem.* 2004;48(2):173-178. doi:10.4081/884
31. Turna A, Yilmaz MA, Urer N, Bedirhan MA, Gürses A. Bilateral elastofibroma dorsi. *Ann Thorac Surg.* 2002;73(2):630-632. doi:10.1016/s0003-4975(01)02862-4
32. Radouane B, El Kharras A, Jidal M. L'élastofibrome dorsal bilatéral. *Feuillets de Radiologie.* 2008;48(3):163-167.